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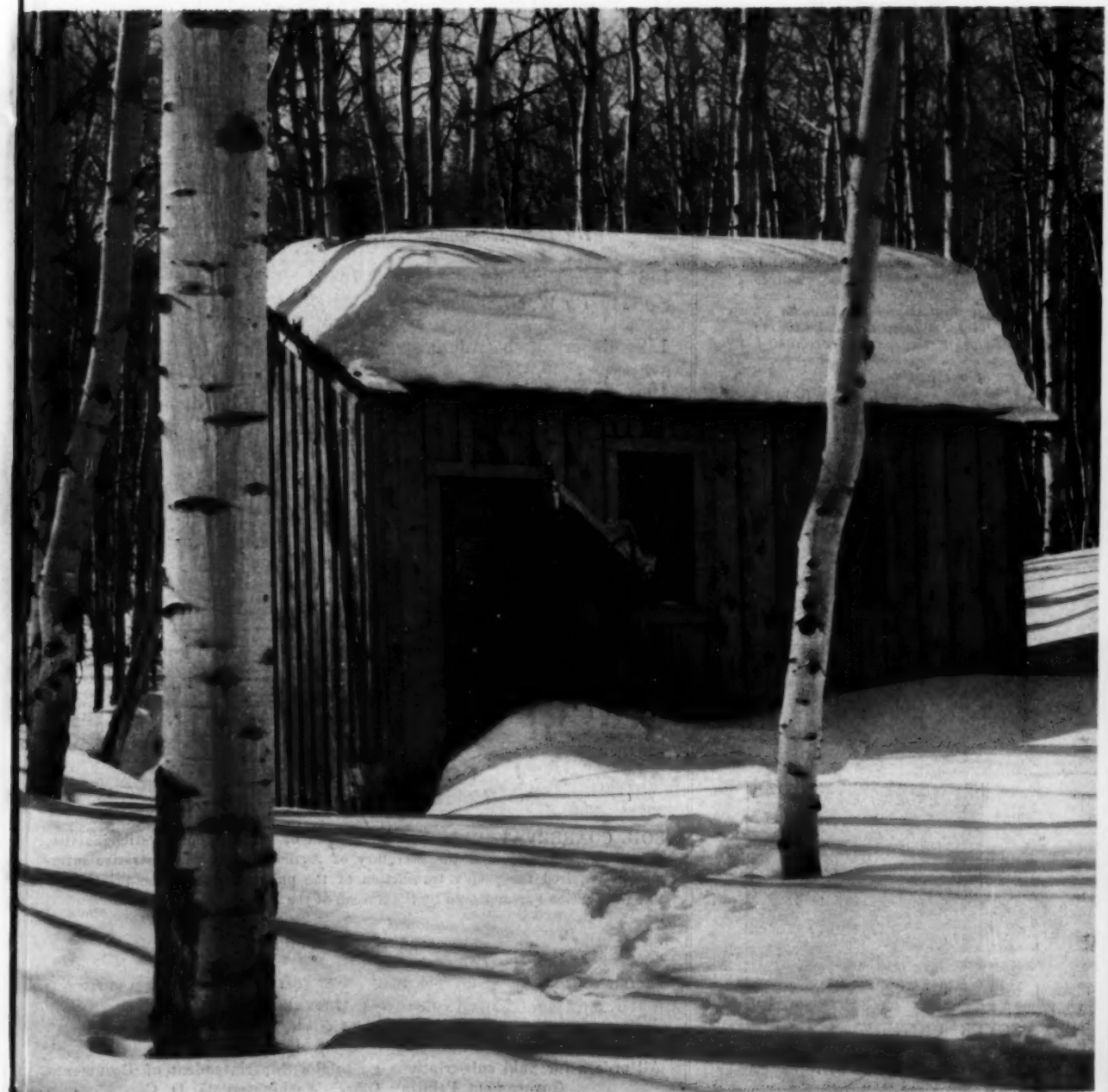
Soil Conservation



SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

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Growth Through Agricultural Progress

"The objective of conservation planning is a soil and water conservation program that coordinates the physical, economic, and human resources on the farm or ranch to achieve the highest personal goals of the land owner and operator, to benefit the whole community, and to meet the longtime needs of our Nation."

—DONALD A. WILLIAMS

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COVER PICTURE.—A snow survey shelter on Baker Creek, Nev., that serves as a rest stop for snow surveyors measuring two courses on nearby Mt. Wheeler.

Soil Conservation

DONALD A. WILLIAMS
Administrator, Soil Conservation Service

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TOM DALE, Editor

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Farm and Ranch Planning—
The Base for Full Conservation

By Donald A. Williams

EFFECTIVE conservation of all our soil and water resources must be planned. Spur-of-the-moment action to meet urgent problems will never give us full and complete protection along with maximum use of these resources. The very complexity of the problems involved demands that carefully thought-out plans be made before extensive changes and conservation operations are begun.

We must have broad plans for the large agricultural regions and river basins of the country. We must have plans for the smaller watersheds and resource areas that integrate into the plans for these large regions or basins. These things are essential for an effective overall conservation program for the Nation. But even more important, we should have sound plans for the use and treatment of all tracts or parcels of land, large or small, because each tract—even each acre—may be different and require a different type of use or treatment. And it is on the individual tracts of land that most of our problems start—that is where the rain and snow fall, where the runoff and erosion begin, and where the production of our food, fiber, timber, forage, and wildlife originates.

Yet it is impractical to try to develop individual plans for each field or pasture of a farm or ranch while ignoring the developments on the other fields or pastures of that farm or ranch, because the farmer or rancher must manage the entire farm or ranch as a unit for successful, economic operation. That is why we say that the farm or ranch is the basic unit on which conservation planning and application must begin.

It is true that a farm or ranch conservation plan is only the beginning and it is of little value unless the cooperator's decisions are carried out. But the importance of the plan lies in the fact that the needed land use changes and conservation practices seldom will be applied in the right way and in the right sequence without a good plan. That is why we must, as soil conservationists, stress the importance of sound conservation planning.

There is nothing wrong with applying suitable conservation practices one at a time, provided each contributes toward a coordinated program. In fact, most conservation programs are carried out by applying single practices, as they are needed; i.e., in accordance with plans. But the application of single unrelated practices may increase the conservation risks of a whole farm or ranch instead of solving the problems if they do not fit into a coordinated plan for the entire unit.

The conservation planning process is systematic decision making, based upon a logical evaluation of the alternatives for land use and treatment. It must involve a careful inventory of the soil and water resources and the collection of data in a systematic form to determine not only the best practices from a conservation viewpoint, but also the economic consequences of all practical alternatives of use and treatment of the land.

There may be many different ways in which each tract of land may be used and treated successfully to conserve or improve it. Obviously it is not practical to consider each and every alternative for each plot of land on a large farm or ranch. But it is possible, and usually practical, to consider several alternatives for the farm or ranch as a whole. And the farmer or rancher should participate in developing, with the guidance of the assisting technician, the most practical, sound alternatives for use and treatment. Then he will be able to make a choice, in line with his desires and financial resources. He will be able to make a sound plan.

And that is most important of all—the fact that the farmer or rancher does have a choice and that the conservation plan is *his* plan, not an SCS plan. A good conservation plan is simply a record of the farmer's or rancher's decisions on how he will use and treat his land, after considering the alternatives with the conservation technician. If it is not the farmer's or rancher's plan, and regarded as such by him, we cannot expect it to result in sound conservation on the land.

What Farmers and Ranchers Say About Conservation Plans

By Cal L. Roark

HUGH Hammond Bennett told his listeners at North Carolina State College about two years ago: "Practically all farmers need the specialized scientific assistance of experienced technicians on the ground to help solve their more complex land and water problems. . . . In a sense, Soil Conservation Service technicians are land doctors, who have learned that halfway measures and improperly applied practices not only fail to get the job done but often do more harm than good over a period of years."

Certainly he has stated the viewpoint of the professional soil conservationist. But what do the farmers and ranchers think and say about the conservation plans that SCS technicians have helped them prepare and apply?

To Jess McGinley of Nebraska, "A conservation plan is a state of mind. It's like a big idea you have in your head all the time; and every time you fly over your range, or ride out on horseback, or put out salt, or do any other job you always have that idea in front of you, and you're looking around to see how you're fulfilling it." McGinley has a 33,000-acre ranch in Cherry County.

Frank Simler of Woodland, Idaho, who farms with his brother and father, explained: "A conservation plan ties up the loose ends and allows us to plan and have some hopes of carrying out our plans. It is something tailored to our needs and desires that helps us use our soil to the best advantage and still leave good land to pass on to our children."

Klass DeWilde of Shiloh, one of the leading growers of ornamental nursery stock in New Jersey, considers a district conservation plan "of very great value." His reason: "It is best to put the practices on the land before trouble develops instead of trying to repair damage after it occurs. And because these plans have worked out wonderfully for us," he wrote the local SCS technician, "we will in the future, as we have done in the last 8 years, follow an overall (conservation) plan on all the farms we purchase."

Concrete evidence of the worth of a conservation plan induces landowners to stick to a planned program for their farmlands. J. T. Minchew, who operates his own 1,100-acre farm in Ware County, Ga., first became a cooperator with the Satilla River SCD in 1943 and has had his conservation plan revised three times to adjust to changing conditions. He says: "Since I have had a soil conservation plan on my farm and have used my land according to the plan, my corn yields have jumped from 10 to 127 bushels per acre, and tobacco yields have gone from 1,000 to 2,300 pounds an acre."

Most people acquainted with conservation farming now recognize that it is good business. Winton Palmer of Knox County, Ind., says that his planned conservation program has doubled his farm's value in 10 years. Palmer believes that 90 percent of the land in that county that now changes hands is being bought by district cooperators. "They are the only ones with money to buy it. And they know what they can do with so-called 'worn-out' land when they get hold of it," he explained.

President W. E. Carpenter of the Farmers and Merchants Bank of Lineville, Ala., sized up the bankers' viewpoint with this comment: "We have found that less risk is involved when a borrower has a detailed conservation farm plan. A larger percentage pay back their loans on schedule. In fact, many of our borrowers in past years are now depositors and no longer need loans—a direct result of the wise application of conservation practices that were outlined in their farm plans."

ASC County Committee Chairman L. G. Caskey of Jacksboro, Tex., has observed that "farmers who receive the greatest and most lasting benefits from ACP cost-sharing are those who have a definite, longtime conservation plan and use ACP to help them carry out that plan."

Some people may doubt the value of a conservation plan. A fertilizer distributor in Indiana asked: "Can you really say that a farm plan has given you results?" George Gadson, Jr.'s reply before the group was: "Even a blind man can tell, if you'd let him feel the soil or let him walk over it." Gadson is chairman of the LaGrange SCD.

Robert Fain, of Felt, Okla., tells

Note:—The author is soil conservationist, Farm and Ranch Planning Division, Soil Conservation Service, Washington, D. C.

about conservation farming on his 3,432-acre ranch: "This has been a lifesaver to me. Before, I was overworked trying to get everything done, managing my cattle and grass and trying to keep my cropland from blowing. This Great Plains Conservation Program not only has helped me with my conservation job, but it has brought about a more efficient operating plan. I never realized that there was an easier and better way of doing things. It really fits our area."

Tony Krebs of South Dakota, writing for the NASCD Newsletter of December 1959, told of watching the building of a small business house for which the owner did not have an architect draw up a plan. As a result many parts had to be redone, some as many as four times. Krebs explained: "A farm or ranch plan is even more important. Damage to the land can be very costly before a man catches up with the mistakes of doing the right thing at the wrong time. A complete farm or ranch conservation plan is the way a farmer or rancher, truly wanting to do a conservation job, will go about it." Among several things he listed as advantages of having a conservation plan was this: "It gives a farmer or rancher a chance to grasp the full meaning of soil and water conservation, to understand the reasons behind every step he takes in getting his plan done. That is very apt to make him a real conservation farmer or rancher for the rest of his life."

Frank Thompson, a rancher near Helena, Mont., and a supervisor of the Lewis and Clark SCD, expressed a similar opinion about conservation plans in the District's 1959 Annual Report: "Would you build a house or barn without a proper foundation for the superstructure? A farm plan has this same relationship in the overall farm operations, rather than an unrelated topsy-turvy approach on one or two practices."

Many farmers find themselves with land that is literally washing away, as did J. E. Ford of Amelia, Va., who in 1936 bought a badly eroded farm. Ford said, "After the first year of farming and a few heavy rains, I realized something had to be done to check the enormous loss of soil and water." Now, with a conservation plan in use, he explained that "soil losses have been greatly reduced, eroded spots have almost disappeared, and the yields have more than doubled."

To the fellow who moves into unfamiliar country to farm, a conservation plan can help him get off on the right track; without it, he can have a rough time for years. Take the case of Frank T. Morrow of McMinnville, Oreg., and the 1,316 acres he bought and came from eastern Oregon to operate. All but an 80-acre tract of bottomland in crops was logged-over hillland timber and he was getting poor results from his efforts to de-

velop it for pasture and range. Here's Morrow's own story: "I didn't know local conditions and was having a rough time until I developed a conservation plan five years ago with the help of the soil conservation district and the SCS technicians. My plan gave me an understanding of my soil and what it would grow best. I learned that I must become mostly a tree farmer rather than a rancher. My livestock now is a minor part of my enterprise and I am making real money on farming trees. That's what that hill land is suited for—not grass. Salvage logs and selected trees cut to improve my woodland stand have more than met the payments on the ranch, and income from the cropland is gravy. Before my plan I thought of the trees as only being in my way. Why doesn't everybody become a conservationist and use his resources to the best advantage?"

What does a planned conservation program mean to you? Eugene Blackketter of Leedey, Okla., is confident that he knows. Listen to him: "Conservation to me is a must. I have seen fields change from a grillwork of ditches to an orderly terraced field with no ditches, pastures with controlled grazing from a weedy exercise ground to a lush, succulent pasture. Proper conservation to me spells the difference between a history with no future and a history with a wonderful future."

Some landowners tell SCS technicians that their conservation plan makes the job of managing their farms much easier. Milton O. Reeves, of Madison County, Tenn., stated it simply: "My trouble in farming has always been that I could never do everything I needed to for a good job. But now my conservation plan helps me get ready for the job ahead. I can see what I need, when I need it, and how the job should be done."

A. O. Hamnes of Stephen, Minn., who runs a straight grain operation in a five-year rotation on his 1,760 acres, expressed it a bit differently when asked if he liked his conservation plan: "Like it? I wouldn't be without it. It sure does cut down on the headaches in the spring. Now I know just where everything is going. It was a lot of work to figure it out in the first place, but it sure comes in handy."

Bill Crocker, a young dairyman at Georgia, Vt., stated his case briefly but to the point: "My farm plan helps me think ahead." So did Sherman Black of Yuma, Colo.: "A conservation farm plan gives you a new look at your farm." Another Yuma SCD supervisor, Bud Mekelburg, figures "The time spent in working up a farm plan is the cheapest and most worthwhile investment a farmer can make."

Several of the great people in America's early history, notably George Washington, wrote of the need for better care of the land. But until a comprehensive conservation plan for the entire operating unit is developed, many of the needed improvements are left undone and unrecognized. Such was the case on "Wessyngton," the large farm owned and operated since 1798 by collateral descendants of the first President. George A. Washington, present owner of the Robertson County, Tenn., farm, recalls that little was done in the way of scientific conservation until 1943, when a complete farm plan was developed with his local soil conservation district. Since then the land use has been adjusted and conservation treatment measures applied.

Tenants and landlords alike often express their appreciation for help received in conservation planning and application. For instance, three years ago W. W. McCoy of Ackworth, Iowa, wrote the Warren County SCD enumerating the benefits he had received. McCoy rents a 200-acre farm owned by a man from Topeka, Kans., who makes two trips a year to the farm. It was on one of these visits that they decided to correct many of the problems arising from erosion and over-cropping. With the plan developed, McCoy wrote, "When we corresponded we used the plan; all fields were numbered and we referred to each field thus when planning farming operations or conservation projects. This plan made it especially easy for me to plan my operations ahead." And even with four years of drought, most of the conservation work has been done, benefiting, as McCoy put it, "the farm as well as me."

Thousands of young men first learned about soil conservation and the help they could get through their soil conservation districts when they were enrolled in GI farm training after World War II. A great number of them today are topnotch conservation farmers, although for many it was pretty tough sledding. Eugene Johnson of Wake County, N. C., is one farmer who spent the first five years after the war as a tenant before buying a 130-acre farm with only 15 acres of open land, "a considerable mortgage, and land and buildings in poor condition." But Johnson got the SCS technician he had met in the GI class to help him work out a satisfactory conservation plan; and he persevered in his efforts to give new life to abused, naturally heavy soils. "The original plan is almost completely applied now," Johnson explained. "It would have been impossible for me to improve my farm as I have without realistic plans. I have built a comfortable home and expect to pay my last major debt this fall."

◆

More than two-thirds of last year's agricultural exports from the United States went to 14 countries. Largest importer of U.S. farm products was the United Kingdom. Others in the top five were Japan, Canada, West Germany, and the Netherlands.

Basic Theory of Soil Conservation Plans

By Charles E. Kellogg

THEORY and practice conflict far less than is commonly supposed. Good practice is in accord with good theory, either by accident or design. Where theory is lacking, we must fall back on the wasteful methods of trial and error. With good guiding theory, much of the waste can be avoided.

Research and experience of the past 25 years have led to some substantially sound theories on planning soil and water conservation programs for farm and ranch operating units. These operating units are "firms" in the business sense. The manager needs to deal with individual parts of his tract differently, yet each part influences the choices he makes about the other parts. The choices among alternatives are so many and so complex that few can make orderly decisions without a written plan.

The knowledge we have gained over the years about the potential behavior of the kinds of soil shown on a soil map serves as one important basis for the conservation plan of an operating unit.

The most effective plan must provide for significant sustained production—for efficient use of the soils to obtain an optimum level of productivity.

Although some of the dark-colored soils of the Corn Belt are highly productive for grain crops when first cultivated, most soils are not. And the highest yields of grain are more commonly found on arable soils of the eastern United States or of western Europe, which have been substantially improved through use.

This potential for improvement is continually increasing. Not only can we get higher yields economically with the same soils that we have been farming, but also we can get economic yields on soils that were considered unfit for farming with the methods known a few years ago. Thus in modern agriculture the important question about soil productivity is not what a soil can produce in its present state, but how it can respond to management.

Each soil has many characteristics. Some are rather easily changed. For example, acidity can be corrected on most soils by liming; additional nutrients can be supplied by chemical fertilizers or in other ways. But other characteristics are difficult to change. Examples are steep or irregular slopes and thin rooting zones over hardpan or bedrock. But even these can be changed, and are changed in many crowded places where other growing factors are favorable.

No one soil characteristic exerts an influence apart from the others. The potential of any soil to respond to management is determined by the interactions among many soil characteristics. It is a fundamental principle in soil classification that kinds of soil must be defined as combinations of many characteristics. With some combinations, for example, small differences in slope may make wide differences in erodibility. Soils with other combinations of characteristics are not highly erodible even on slopes of 30 to 40 percent.

Then too, the response of a soil to management is always a response to a *combination* of practices, interacting with one another and with the soil characteristics. That is, one must have the right combination of many soil characteristics and several management practices to get even a mediocre crop of corn. This principle of *interactions* is the most important principle of soil management.

A minimum of four broad groups of practices, in proper relationship to one another, are vital to a successful harvest. And every good harvest on every acre of arable soil in the world has resulted from a good combination of these four, either by design or by accident: (1) A proper balance of plant nutrients; (2) adequate supplies of air and water in the rooting zone; (3) appropriate crop varieties; and (4) adequate crop protection from insects, diseases, weeds, and other hazards.

These four broad groups of practices can be subdivided and added to in many situations. For example, we may build terraces to conserve water and, at the same time, to prevent soil erosion. On some soils special tillage, plantings, or structures are necessary to avoid soil blowing, catastrophic erosion, and other hazards.

The vital point is that the practices to reach all four objectives must be carried out at the proper

Note:—The author is Assistant Administrator for Soil Survey, Soil Conservation Service, Washington, D. C.

time to support one another on each acre. Otherwise really high outputs for the labor and materials used cannot be expected. This takes planning and scheduling. Few people can remember the details and carry them out for good success unless the plans and schedules are written down.

Let us consider a few examples of interactions. No benefit can be had from controlling erosion and increasing the nutrients in a soil beyond the limit of the water supply in the rooting zone or the genetic limit of the crop variety to respond. The most successful irrigation and drainage developments are those designed to *control* the water in ways that permit us to eliminate water or air as limiting factors. This means proper design of ditches and outlets and accurate leveling so that we may do a good job of water control. This is expensive. And the cost rarely is returned in good harvests, at least not for very long, unless plant nutrient deficiencies are also eliminated. And then we must have a variety that has the genetic potential to respond to this highly favorable soil environment. And the crop must be protected.

It is not uncommon to find statements about how much the production has been increased due to erosion control, to plant breeding, to insect control, to fertilizers, and so on. If all of these claims are added, we may get a figure several times the total harvest, with no allowance for the rain, the sun, the labor, or even the soil itself.

Experience with hybrid corn is a good example. Early hybrid corn spread rapidly on the fertile soils of the Corn Belt because the old varieties did not have the genetic ability to respond to the soil environment already available. But on soils of lower fertility hybrid corn did not significantly outyield the older varieties until additional fertilizers were used. Even yet we find people ascribing most of the increase in corn yields to fertilizers, others to erosion control and soil building practices, others to the hybrid seed, and still others to machines. The point is that all were involved together and our high production could not be had if any one were dropped out.

Even some soil scientists have neglected the great importance of crop variety. We should recall that many of our plant varieties were selected over previous generations partly because of their ability to grow on poor arable soils. Through this selection process farmers had varieties that would make at least a fair harvest on infertile soils with bad water relations. But commonly in this process of selection the genetic ability to respond to a much better environment was eliminated.

I recall some experience in the Punjab of India. Here corn had been selected over many generations to grow on rather infertile soils that were often dry or waterlogged. With ordinary practices one could expect 25 bushels to the acre. An adapted hybrid would give about 28 bushels. With the soil under proper water control and fertilized the local variety would go to about 28 bushels—not nearly enough to cover the cost—while the adapted hybrid would produce around 100 bushels to the acre. Such illustrations could be multiplied no end.

Many roads lead to soil improvement. But all require planning. Fertility can be increased through growing legumes if they fit into the system otherwise. Manures and composts can be used. Green manures can be grown. But none of these practices is sufficient in itself; they contribute only when related to the soil and the other practices. The farmer is trying to develop a high quality arable soil. What to do depends upon what kind of soil he had to start with.

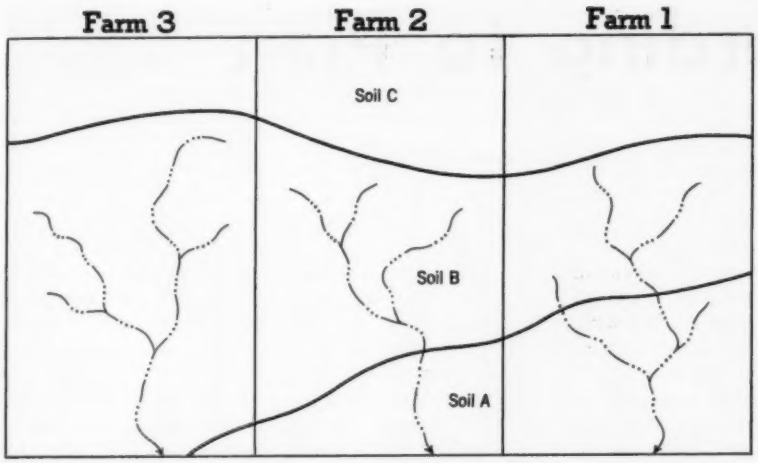
No practice in soil management has universal application. On soils with clayey subsoils likely to become massive under annual crops, the farmer may need to grow deeply rooted perennials to maintain a deep and permeable rooting zone. On other soils this practice, although not harmful, may not be beneficial. We have soils that can grow corn continuously if properly managed; other soils may need to be placed under some kind of rotation that includes grass-legume mixtures, and so on.

In the United States many farmers have installed terraces of proper design. These have helped check erosion and resulted in more water in the soil for plant growth. But some of these farmers failed to include more fertilizer and closer plant spacing in their plans, and thus failed to get significantly bigger harvests from their terraced fields.

Besides these many interactions between soil characteristics and management practices on an individual kind of soil, each field on a farm influences the other fields. Thus one cannot make reasonably good farm plans without considering all of the kinds of soil in all the fields within the operating unit.

This principle is illustrated in the schematic diagram below, which shows three farms having varying proportions of the same kinds of soil. A proper determination of the use of each kind of soil depends upon how each fits into the whole farm unit. Hence, each farm has a different plan for the use of each soil. On nearly all farms both soil patterns and enterprise combinations are more complex than these.

We are repeatedly asked to suggest the "best" use for some particular kind of soil. Such a question cannot be answered in general terms except for unresponsive soils that have only one feasible use. Most of our soils have many alternative uses. That is why in our soil survey work we can rarely give recommendations. What we try to present to the user of the soil survey are the main alternative possibilities and what he may expect from these possibilities. But the selection from any one of these for



This schematic sketch of three farms in the humid, warm-temperate region with three kinds of soil illustrates how the use of any one soil depends on the others in the holding.

Soil A is an alluvial silty clay loam with good structure but slightly flooded and waterlogged in late winter or early spring. It is excellent for meadow, corn, or other summer-season crops. (Capability Class II).

Soil B is a strongly sloping Red-Yellow Podzolic silt loam of moderate permeability that is subject to erosion under clean cultivation. Among the broad alternative uses are: (1) corn and a legume-grass mixure in strips, with or without small grain in the rotation, but with terraces and grassed waterways; (2) small grain and a grass-legume mixture in strips without terraces but with grassed waterways; and (3) continuous legume-grass meadow without special water-control practices. (Class IV).

Soil C is is a nearly steep lithosolic Red-Yellow Podzolic permeable loam that can be used only under permanent cover, either for woodland or for well-fertilized grass-legume meadow. (Class VI).

All these small farms of about 200 acres are adapted to mixed farming with livestock.

The operator of farm 1 can get high yields of continuous corn on soil A and use soil B for hay and pasture. He can sell some cash corn or enlarge his livestock enterprise by putting hay and pasture on soil C.

The operator of farm 2 can grow high-yielding corn on soil A and use part of soil B for hay and pasture in strips with small grain. He can use soil C for woodland or use it for hay and pasture and increase the small grain on soil B.

The operator of farm 3 has only enough of soil A for a home garden. He must use terraces and stripcrop soil B for both corn and hay. He must use soil C for high-yielding pasture.

Clearly the "best" use of soil B depends on the other soils in the farm.

a specific farm plan depends upon how the use of that soil area fits into the operation of the whole unit as a business.

Besides the interactions among practices within a field and the relationships among fields, several other influences affect the choices of alternatives and consequently the farm plan. First of all, the skill and personal preferences of the operator are important. Certainly no one is going to help a farmer to develop plans for a dairy farm if he hates cows. Nor is one going to develop a plan for a complex horticulture farm for an operator lacking skill in that branch of agriculture.

Beyond the factors that lie within the farm unit, one also must think of the factors lying outside of it. For most special crops a suitable market can be arranged only where enough local operators decide to grow that crop. Sugarbeets and cotton are examples of crops that require processing near the farm. This same principle applies to many kinds of vegetables and fruits that also require special processing and marketing.

Availability of credit and technical assistance has a lot to do with the kinds of planning that a farmer can risk or indeed can undertake at all. Many of us take some of the outside services for granted without realizing that they are developed unequally, not only among countries but among various communities in our own country.

The goal of most operators is sustained income. A big job in education has been to get operators to think in terms of several years, not simply the next one or two. In very few situations is there conflict between those combinations of practices that give the most income and those that maintain and improve the soil if the planning is done in terms of 6 to 12 years rather than one year.

In soil management the aim is not primarily for the highest yields. The aim is to get the highest production that we can for the labor, management, materials, and land used in production; that is, the highest net income to the farm family for its labor and investment. Under most situations this occurs at a yield level somewhat below the maximum that might be had by special, expensive measures.

The goals are individual. The farms and ranches are individual. The complexities are many. Guided by sound theory, a soil map, and knowledge of how the soils respond to alternative combinations of practices, an individual plan can reduce the complexities to practical terms for efficient operation. Only with such a plan can a system be developed that makes maximum use of the skills, labor, and investment of the operator.

According to Plan

By J. G. Kennard

THE Fonnesbeck brothers, Myron and Norman, are coowners of a 1,250-acre farm near Weston, Idaho, which they operate on a partnership basis. They say that conservation farming has increased their farm output at least 50 percent.

The Fonnesbecks faced many problems when they took over the farm, 10 years ago. They had some poorly drained land as well as some good land. They noticed also that water erosion and low soil fertility reduced profits.

The brothers had become interested in the principles of soil and water conservation, so they applied to the Franklin Soil Conservation District for advice and assistance. The district supervisors turned the job over to the Soil Conservation Service technicians working with the district.

SCS soil scientists had previously made a soil survey on all of the land in the district. The survey showed that approximately 900 acres of nonirrigated land on the Fonnesbeck farm was quite productive but that a large part of this area was deteriorating because of erosion and depletion of soil fertility. Approximately 40 acres of wet, salty land was producing nothing.

A complete conservation plan was developed for the entire unit.

One of the first corrective measures taken by the Fonnesbeck brothers under this plan was to construct 1,000 feet of open drain and 1,000 feet of tile drain in 1953.

Tall wheatgrass was planted in 1954 on 40 acres of salty land which had been drained. "Ten acres of this land, which had produced nothing before it was drained, yielded 2½ tons of hay per acre in 1959," Myron declared. "Then, in addition to 25 tons of hay produced on this 10 acres, the regrowth produced 2,000 pounds of clean tall wheatgrass seed which we sold."

Contour striperopping was laid out and practiced on 181 acres of steep dryland in 1954. This area was kept under a striperopping system until it was seeded to grass and alfalfa for hay production in the spring of 1957. According to the plan, this grass and alfalfa will remain until about 1962, when it will be 5 years old. Then the fields will again be laid out for contour striperopping which will include strips of grain, fallow, and alfalfa and grass.

According to the Fonnesbeck brothers' plan, all of the nonirrigated cropland will be in soil-build-

Note:—The author is work unit conservationist, Soil Conservation Service, Preston, Idaho.

Norman Fonnesbeck feeding a part of the dairy herd on the Fonnesbeck farm.

Myron and Norman Fonnesbeck examine their winter wheat planted with a deep furrow drill in a stubble-mulched seedbed.

ing grass and legumes at least one-third of the time. As part of this crop rotation plan, 40 acres were seeded to sweet clover in the spring of 1958. Two hundred pounds of available phosphate per acre is applied on all newly seeded grass-legume crops.

The Fonnesbecks always use grass with alfalfa in their hay mixtures on irrigated land. "Grass-legume mixtures provide a better quality hay and are more effective than alfalfa alone in preventing erosion," Norman explained.

The Fonnesbecks have a grade "A" dairy enterprise which is developing rapidly in both size and quality. A milking parlor was built in 1954.

These conservation farmers do not like to invite erosion by letting their land lie bare during the winter. A chisel-type implement of their own design is used in the fall on all stubble fields to leave the straw on the surface. This chisel opens up the soil 8 to 10 inches deep so that the water is absorbed, thus preventing excessive runoff and erosion.

"Stubble mulching, along with subsoiling, grass and legumes on steeper slopes, and systematic crop rotations, not only conserves soil and moisture, but also increases yields," declares Myron.

Thirty-three pounds of available nitrogen per acre was applied in 1956 on 105 acres which had been tilled with the homemade subsoiler. There was a heavy straw mulch on the surface. After applying the nitrogen, a rotary hoe was used to break up the straw. This was followed by using rod weeders during the summer, as needed, to keep the land free of weeds. This land was planted to winter wheat and produced 37 bushels per acre in 1957. Average yields in this area are 20 to 22 bushels per acre.

The Fonnesbecks explain that the stubble they leave on the surface conserves moisture and helps to maintain organic matter. The application of nitrogen is important on heavy stubble mulch, they say, because much of the available nitrogen is used in the process of decomposition.

Harrows have been discarded by the Fonnesbecks on dryland because they say that harrows pulverize the soil too much.

Deep furrow drills are used exclusively for planting their grain. They explain that seed wheat can be placed down into the moisture without burying the seed too deep with this type of drill.

By improving their conservation program, the Fonnesbeck brothers have been able to operate more efficiently and raise the crops of their choice. They have increased the production of forage crops so that they have been able to enlarge and improve their dairy enterprise.

This increased production has enabled them to invest in the modern machinery needed. They now have three tractors, a combine, two rod weeders, one rotary hoe, a mower, a subsoiler, and deep furrow drills. They also have a modern, 320-gallon milk cooling tank, a milking parlor, and modern feeding equipment. With this modern equipment the brothers do all the work on their 1,250-acre farm.

Myron served four years on the board of supervisors for the Franklin district. He now is serving as a member of the Franklin County ASC Committee.

The brothers were winners of the Idaho Grassman of the Year award of the Preston Chamber of Commerce in Franklin County for 1959, because of their outstanding accomplishments and progress in carrying out a planned conservation program.

◆

In a University of Nebraska experiment, vegetables in plots protected from north and south winds by snow fence windbreaks outyielded those in unprotected areas by 16 percent. Wind velocity in the lee of the windbreaks was reduced 50 to 70 percent. The early tomato harvest in protected areas was 16 tons per acre as compared to 10 tons in open areas.

◆

A rain of over 5 inches at Hayes, Kans., left stubble-mulched soil, bone dry before the rain, wet down to 27 to 30 inches. Bare tilled soil was wet only to a depth of 12 to 18 inches.

Farm Plan

By W. C. Lambeth

Robert J. Bowers, a farmer in Lee County, N. C., signed up as a cooperator with the Upper Cape Fear Soil Conservation District and asked the district to furnish him help in developing a conseravtion plan for his farm. The district supervisors requested the Soil Conservation Service technicians working in the district to give Mr. Bowers the desired help.

The first step toward developing the conservation plan was to make a detailed soil survey of the farm. W. I. Shope, SCS soil scientist, made the soil survey. In the picture at upper left, Shope discusses soil characteristics with Bowers while the soil survey is in progress.

With the soil survey completed, J. G. Olive, SCS work unit conservationist, brought a copy of the soil and capability map to the farm and helped Mr. Bowers develop a conservation plan. In the picture at left center, Olive discusses with Bowers the various alternatives for land use and conservation practices to fit the soils of the different fields.

After the conservation plan was completed, I. F. McKinney, SCS soil conservation aid, helped Mr. Bowers establish some of the conservation practices that required special technical skill. In the picture at lower left, McKinney points out to Bowers the location of a special practice and explains how it should be installed.

In this way, Mr. Bowers became a conservation farmer with a basic conservation plan, which he follows in all his farm operations.

Note:—The author and photographer for this pictu[illegible]tory is area[illegible] Lumberton, N. C. This group of pictures, with cap[illegible], won an a[illegible] employees in North Carolina for the best photograph[illegible]say of 19[illegible]

Planning

W. C. Lambeth

W. H. Mills (right) is manager of a nursery owned and operated by the Riegel Paper Company in Robeson County, N. C. The paper company is a cooperator with the Pee Dee-Cape Fear Soil Conservation District. W. P. Elam, SCS work unit conservationist, is shown here pointing out an area on the soil and capability map that needs special treatment, as he and Mr. Mills discuss features of a conservation plan for the nursery.

Paul Gerald (right), a farmer in Columbus County, N. C., is signing his newly completed conservation plan and cooperative agreement with the Lower Cape Fear Soil Conservation District, while F. M. Glover, SCS work unit conservationist, looks on. This agreement had been signed previously by the chairman of the board of supervisors of the district.

James D. Bellamy, Jr., (right), a supervisor of the Lower Cape Fear Soil Conservation District in North Carolina, is discussing revisions of his conservation plan with Hugh F. Kizer, SCS work unit conservationist. Mr. Bellamy's conservation plan was first written in 1945 and he has been following it ever since, but he finds that the plan needs revision occasionally, as agricultural technology advances.

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pictu tory is area conservationist, Soil Conservation Service, h cap , won an award in Statewide competition among SCS ograph ssay of 1959.

Report of the Administrator Soil Conservation Service 1960

IN this dynamic age, with breathtaking advances in science and technology and an exploding population, we should try not to forget the fundamentals of conservation that must underlie the wise use of our soil and water resources. We must keep in mind that the proper use and treatment of land and the water associated with it calls for our best efforts in applying the sciences of soils, agronomy, forestry, biology, hydrology, hyraulics, and related fields in a coordinated program, as called for by each specific situation—that any resource conservation program is only as sound as the technology on which it is based.

Yet, we must also recognize the fact that the people who own and use the land hold the key to conservation progress—that conservation is not achieved by dictation but by people exercising freedom of choice, usually motivated by the opportunity to better their way of living.

The greater part of our soil and water conservation work will be done on the farms and ranches of the Nation by the farmers and ranchers who operate those units. That is where the major efforts must be directed.

But the nonfarm beneficiaries of soil and water conservation and watershed protection now outnumber farm and ranch people by about 9 to 1. The ratio apparently is widening year by year. This fact should have at least two meanings for soil conservationists.

It means, first, that our responsibilities are broadening. We need, more than before, to consider the needs and desires of the nonfarm population in the soil and water conservation program. As soil conservation districts broaden their concepts of responsibility to their communities, we may find them requesting more and more technical aid for conservation work of primary benefit to nonagricultural interests.

A second implication is that a more intensive informational job may be needed. Many of the nonfarm beneficiaries of soil and water conservation are unaware of their stake in conservation and their responsibilities for it. It isn't enough that they be merely passive recipients of conservation benefits. They, like the farmers and ranchers, will lend their support and cooperation to the conservation movement mainly as they recognize its importance to them.

We know that on each farm or ranch there are alternative uses for land that may be equally productive, assuming that proper combinations of conservation treatments are used. In a like manner, there may be equally desirable alternative uses for land in the total picture—as food- and fiber-producing fields, as watershed areas, as recreation space, as transportation lanes, or as living, working, and playing room for our expanding population. Some areas may be suited for multiple use. For example, an area might well serve for timber and wildlife production and at the same time be a valuable watershed and recreation area. In the main, however, most of our primary needs for land space are competitive. It is hard to visualize a field being used for food crop production while also serving as space for an industrial plant or highway.

Yet, choices must be made as to how we are going to use the total land space. Many such choices must be made now or in the immediate future, especially in areas near great population centers. Some of the choices we now make may be irrevocable. We cannot wait until the pavement is laid on all the needed highways and airports, until a decentralized industry has built all its plants and appurtenances, until the urban sprawl has expended itself, to make the plans for the wisest use of our limited land space. If the country is to make sound decisions about which lands are to be saved for future agricultural production and which are to be used for the multitude of competing purposes, we must have sound land-use planning at the local, regional, and national levels.

Note:—This article is a digest of a report for the fiscal year 1960 submitted to the Secretary of Agriculture by Donald A. Williams, Administrator of the Soil Conservation Service.

And again, the land-use planning cannot be done effectively by dictation. It must be done largely by persuasion—by convincing the land users and potential users that long-term planning is best, and eventually will be beneficial to them. There may be many seeming conflicts of interest between various types of land users, especially between agricultural and nonagricultural users. A suitable solution for such seeming conflicts usually can be found, however, if the advantages and disadvantages of all alternative uses are fully understood by all people involved.

All this means that a successful conservationist today must not only be a sound technician in his field, but also must be a student of human relations and be informed about the sociological changes that are coming so rapidly. He must understand that the people who own and use the land exert the dominant influence in determining the what and how of a conservation program—that they must make the choice as to which land is used for highways, airports, suburban homes, recreation parks, agricultural production, and other purposes. And they make the choices about what kinds of conservation treatments are applied to the land. But the people concerned must have correct information in order to make wise choices in these matters.

Soil conservation districts and other conservation agencies have done an excellent job during the past two decades in educating agricultural land users about good land use. In many communities they have done an adequate job of informing the nonagricultural population about their stake and responsibilities in the conservation program. It seems that the best job usually has been done in communities with acute problems that affect both farm and nonfarm people, especially where water or watershed problems are involved. Some of the best overall community land use programs have evolved from town and country people getting together to solve their mutual watershed problems. In fact, the small watershed program of recent years has probably done as much or more to bring farm and city people together as any other specific program. But much remains to be done about informing our great nonfarming population of their stake in the soil and water conservation program.

The Soil Conservation Service has been delegated wide responsibilities in the resource conservation program. A principal responsibility is still the furnishing of technical assistance to individual farmers and ranchers cooperating with their local soil conservation districts. But working with local groups and organizations on watershed protection and other community problems is becoming of more and more importance. And the welding together of all the various programs into an integrated program that deals effectively with all the problems is becoming more important as the complexity of present-day problems increases.

The following pages recount some of the progress made during the past year in the various fields for which the Service has responsibilities.

Soil Surveys

Progress in all phases of soil survey work was made during the year. The general response of the public in the use of soil survey information was particularly gratifying. Perhaps a major new interest has been in the engineering interpretations of soil surveys. Of course, the opportunity to use soil surveys in developing highway plans and in other structural fields has been there for a long time; but the interest in their use is now growing phenomenally.

People generally now accept the basic facts displayed in soil surveys. These facts are no longer controversial. But the interpretations of the soil survey information are sometimes controversial because of the wide variation in purposes for which the surveys are used. This is especially true in rurban areas where soil information is used primarily for county or community planning and zoning. Soil interpretations also may change in agricultural areas as technology, economic conditions, and power developments change. But the basic facts presented by the surveys will not change and should always be available for reinterpretation as needed.

***Soil Survey Operations*—Field soil mapping covered 50,159,493 acres during the year, compared to 48,030,068 in 1959. This is an increase of about 4 percent and is mainly the result of improved management and scheduling of soil surveys.**

Standard soil surveys are being made in 1,964 areas. Of these, 841 are progressive. Soil surveys, not yet converted to standard, are being made in 923 areas. In these areas soil conservation surveys are being made mainly to satisfy the soil information needs for farm and ranch planning.

More than 658 million acres have been mapped in the United States as of June 30, 1960, with sufficient detail for use as base data in conservation planning of farms, ranches, watersheds, and for other purposes. This is more than one-third of the total land area of the United States and about 53 percent of the agricultural land in soil conservation districts.

The Service has been assigned responsibilities for planning and placing in a state of readiness a nationwide system for the radiological monitoring of agricultural lands and waters, livestock, and farm commodities on farms, ranches, or at bin sites in case of neuclear attack. This assignment includes the post-attack use of radiological information to determine circumstances under which lands may be returned to production and the farm produce and commodities safely used.

The Service has been assigned 1,320 fixed Federal monitoring stations. In gearing up to man these monitoring stations, instructor training was provided by an Agricultural Research Service-Office of Civilian Defense Mobilization team to all State soil scientists, the principal soil correlators, and 5 members of the Washington staff.

The State soil scientists, with help

from OCDM and ARS field offices, have trained 492 SCS people as radiological monitors. This type of training will be speeded up in fiscal year 1961 as equipment is made available to the States for monitoring.

Soil Classification and Correlation—Field mapping was initiated during the year in a number of areas where soils had not been studied previously. During the year, 37 tentative soil series were established and 72 dropped after a period of testing. Beyond that, 52 series established earlier were placed on the inactive list because of conflicts with other series or because they were not clearly defined. The total number of established and tentative soil series in the country remains near 7,000.

A project was started during the year for placement of selected information about individual series on punch cards as an aid to classification and correlation. Interest in this approach was indicated in a number of places in this country and also by soil scientists in other countries.

Work continued on the revision of the nationwide system of soil classification. During the year, further trials were made in the grouping of series into classes in higher categories. A report describing the revised system was prepared during the year and issued as the 7th Approximation of a revised classification system.

Soil Survey Interpretations—Twenty-seven edited soil survey reports with accompanying map materials were sent to the Government Printing Office during the fiscal year. Thirty-eight reports and maps were published, leaving 52 in the Government Printing Office at the end of the year awaiting publication.

Most soil survey reports now contain engineering interpretations of the soils, in addition to the usual land capability interpretations. Of the 52 reports in press, 29 contain engineering test data and others contain engineering interpretations.

Four of the reports published during the year and 12 of those in press contain descriptions of range sites and a list of the soils in each site. Fifteen of the reports in press contain interpretations of the soils in terms of woodland suitability groups. Several reports contain interpretations useful in urban planning.

Plans call for all future soil survey reports to contain soil engineering interpretations and woodland, range, and other soil interpretations where they are important. Improved climatic interpretations also are being placed in soil survey reports.

A new map legend was added to recent soil survey reports. This legend helps the map user to go directly from the symbol on the map to the page in the report where the desired information may be found.

Considerable progress was made during the year on correlating capability groupings between States. The Northeast has completed the correlation of the capability groupings between States within that region.

A detailed study of the use of published soil survey reports was completed. Most of the respondents in this study were reasonably well pleased with the form and content of published soil survey reports.

Soil Survey Investigations—Physical and chemical studies for characterization of the soils of the United States continued at a slightly reduced rate. Increased emphasis was placed on studies of soil profiles to improve the knowledge of soil genesis, and to improve the soil classification system. Field studies were made of soils of Hawaii and Puerto Rico to bring about a better classification for soils of tropical regions.

Investigations in cooperation with the U.S. Plant, Soil, and Nutrition Laboratory have been completed on cobalt deficiencies in the Southeastern States, and are nearing completion on molybdenum toxicity in Western States.

The World Soil Map Group extended its basic soil mapping in several countries. Major emphasis continues on new interpretations of both new and old mapping. Compilation of a new 1:5,000,000 general soil map of the United States has continued in terms of the new soil classification system.

Plant Technology

During the year there were many instances of progress in the various phases of plant technology, especially in the broadened demand for technical assistance by rurban landholders, the refinement of standards and specifications, and coordination of practices across State lines. A few random examples of progress follow:

Analysis and Coordination in Agronomy—One of the significant improvements during the year was the progress in analyzing the agronomic phase of the total Service program at area and State levels. The analysis provides a good picture of the problems and needs in agronomy that require attention in order to improve conservation accomplishments on crop and pasture lands. Progress was made in the correlation of agronomic specifications across State boundaries where comparable soil and agricultural conditions exist.

Improved Windbreak Design—In the Great Plains a significant change has taken place in the pattern of field windbreak plantings. Instead of being planted in multiple rows, windbreaks often consist now of a series of single rows across a field, referred to as pattern-type windbreaks. Since this type of windbreak planting has been introduced, the increase in acres protected has been manyfold.

With the single-row pattern-type field windbreaks less land is taken out of cultivation; more acres are protected; the windbreaks are easier to maintain; the trees grow better; the cost per acre is less; and better wildlife protection is provided over larger areas.

Rating Soils for Wood Crops—One of the outstanding contributions to woodland conservation during the year was the progress in rating soils for the production of wood crops. West Virginia and Vermont had developed soil interpretations for woodland use a year ago; now this type of information is available for field use in Maine and New Hampshire and, within a short time, will be available in Massachusetts and Virginia. Studies began in New York State during June.

Approximately 1,500 observations have been made to date in the Northeast as a basis for this type of information, which is basic to the practical management of small woodlands as a part of soil conservation.

Biology in Rurban Areas—During the past year more and more rurbanites, as well as farmers and other landowners, asked for assistance in treating their lands for wildlife. In addition to farmers with specialized interests in wildlife, people with land but no inclination to farm requested help on varied and complex land use problems involving the application of biology techniques.

Combination marsh-ponds designed to provide fish, wildlife, recreation, and fire protection have been developed on a number of rurban properties.

During the year there was a marked increase in requests for assistance in planning the land use layout of shooting preserves. Particular emphasis has been placed on determining planting patterns consistent with soil conservation objectives.

Livestock Production in Southern Woodlands—It became apparent during the past year that the Soil Conservation Service is playing a major role in bringing about an appreciation of the economic importance of grazing as a secondary use on southern woodlands. Twenty years ago woodland grazing was generally associated with wildfires, overgrazing, large numbers of livestock running in trespass on other people's property, and extensive damage to the reproduction of important timber species. Nearly all large landowners, foresters, and conservationists joined the crusade to "get all livestock out of the woods."

Today, assistance in conservation planning by Service technicians is helping landowners determine which kinds of woodlands are potentially capable of producing enough forage to justify grazing use; when the woodlands should be grazed; the intensity of grazing compatible with perpetuation of the forage crop and necessary protection to timber reproduction; the need for water developments and fencing to improve grazing distribution; and the kinds and amount of tame pasture and hay needed to supplement the woodland grazing on each operating unit.

Much more remains to be done, but improved grazing management on many thousands of acres of southern woodlands already has led to increased forage supplies, greater livestock production, higher income and greater economic stability, as well as better protection of the soil resources in the Southeast.

New Plants for Conservation—During the year a number of new plants were named and released for conservation use in the Western States. In the Great Plains, Garrison creeping foxtail, initially tested and increased at the Bismark, N. D., Plant Materials Center, was certified by the Wyoming Crop Improvement Association. It is coming into use in wetlands and irrigated pastures in Wyoming and Montana.

Holt Indiangrass, a Nebraska selection made by SCS in 1935, took its place, along with other native grasses, in permanent grass seedings. Eight registered seed growers are now producing seed of this grass.

Seed blocks of Vinall Russian wildrye, a superior cool-season strain, were developed cooperatively with ARS. Foundations were established at Bismarck, N. D., and Los Lunas, N. Mex. Registered seed growers in North Dakota and Nebraska Experiment Stations are producing seed.

Other promising plants in the West are Great Basin wildrye in Idaho and a strain of buffelgrass in Hawaii.

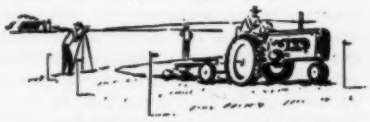
Seed harvesting techniques, including special machinery, have been developed for a promising new legume, *Desmodium intortum*, in Hawaii. Further improvements now in progress will result in spreading the use of this valuable legume as a needed companion of Pangolagrass.

In the East, new plants named and released included Clanton tickelover, *Desmodium perplexum*, a native legume from North Carolina having superiority in ease of establishment. It is used for wildlife food and cover, as well as for hay on land that is not suited to other legume hay crops.

A new crown vetch, Chemung N. Y. 669, was selected from numerous accessions at the Big Flats Plant Materials Center. Tall oatgrass, N. Y. 867, a late-maturing selection that coincides with the blooming date of alfalfa, was also developed at Big Flats. It is in demand for hay production on droughty soils in the Northeast.

Better Techniques for Establishing Conservation Plants—During the year the use of paper and fiber nets proved their usefulness in helping to stabilize bare, steep banks. Use of a coarse jute net showed that it could function as a kind of mulch, and a lighter paper net used to hold hay or straw mulch in place aided in the establishment of vegetation on raw cuts and fills. Both of these materials also proved valuable in protecting young seedlings in waterways until they were fully established.

Experience also indicated that seedings made at the base of slopes were especially effective in stabilizing steep shoulders and cuts on roadways. When fertilized and seeded to adapted grasses, strips planted across the lower part of a slope stabilized 10-foot banks in three years, when treatment started at the bottom and was extended up the slope in succeeding years. This inexpensive, simple method, used on secondary roads in Georgia, is spreading to other areas in the Southeast.



Engineering

The workload in engineering aspects of the soil and water conservation program continued to increase, mainly as a result of the stepped-up pace of the small watershed protection program. The training program for engineers was intensified during the year. Further handbook and guide materials were developed and design work was standardized as much as possible to help speed up the work of the available engineers and aid in the training of new engineers. Progress in some aspects of the engineering work follow.

Erosion Control Practices—Considerable progress was made in obtaining uniformity in engineering surveys and recording notes on ACP practices for which SCS has technical responsibility.

Continued attention was given to the refinement of design criteria for terraces. Field trials on terrace spacing are in progress on selected soil areas in Illinois to evaluate different terrace spacings for cropping systems of varying intensities.

In Iowa selected fields with irregular topography were satisfactorily terraced by making cuts and fills along the terrace line. Terracing, though needed for protection of such fields, was not considered practicable under the previous concept of terrace construction due to the difficulty of farming terraces with extremely irregular spacing. Alinement was greatly improved by the cut-and-fill method.

In the Southeast, considerable progress was made in developing methods for efficient use of moderate-size equipment in the construction of terraces and waterways. This included a form of land leveling or smoothing ahead of terrace construction to achieve terrace alinement suited to large farming equipment. It is resulting in added acceptance of terraces by farmers.

Drainage—Progress was made in the practice of land grading and smoothing for drainage. Relatively flat fields normally contain small irregularities and depressions which pond water one to six inches deep after rains. Where the soil in the depressions puddles and the soil structure breaks down, drainage is impeded and crop yields are decreased. It has been demonstrated that on many soils it is feasible and profitable for the farmer to move a considerable amount of soil to grade and smooth his fields.

Soil conservation districts have played an important role in the spread of land grading and smoothing for drainage. Many districts have sponsored demonstrations of the practice. Thousands of farmers have become familiar with the practices through SCD demonstrations. In the Southeast there was continued interest in water control on wet woodlands to improve timber production. Many large companies are undertaking such work at their own expense with consultation from SCS technicians.

Progress was made in obtaining better quality drain tile. The American Society of Testing Materials issued a new specification for clay drain tile which includes

a class of tile known as "heavy duty." This will provide a tile up to 80 percent stronger than "extra quality" which was formerly the top grade. The "heavy duty" class is needed to provide safe tile in deep trenches.

A guide for the use of concrete tile in acid and alkali soils was developed. This guide establishes limits for different classes of concrete tile in acid and sulfate soils.

Irrigation—Work on PL 566 projects and special problems is taking an increasing amount of time of irrigation engineers because of the increase in the number of projects having irrigation features.

The last of the Case-Wheeler Projects, the Eden Valley Irrigation Project in Wyoming, was completed this year.

Service personnel continued to work closely with the American Concrete Pipe Association, Society of the Plastics Industry, and Steel Plate Fabricators Association in developing new standards for irrigation pipelines.

Continued progress was made in preparing adequate irrigation guides.

Hydrology—There was a significant increase in the demand for assistance in the hydrologic aspects of watershed planning and operations.

Plans were developed and work is progressing on the processing and analysis of data collected in the pilot and other gaged watershed projects.

Volume-duration-frequency computations were completed on a 26-stream pilot project. This type of information has been requested by many States to aid them in determining reservoir storage requirements. To date, approximately 9,400 station-years of streamflow records from New Mexico, Oklahoma, Texas, Kansas, Arkansas, and Louisiana have been processed by electronic computers to tabulate the annual maximum flow-duration data.

Snow Surveys and Water Supply Forecasting—A cost study of the snow survey program resulted in increased financial support of the program by cooperating agencies. The use of markers for air observation of snow depth was increased along with a 2-percent increase in snow courses during the year. A new electronic data-processing program was developed, and much of the snow survey and related data are being put on a standard form which can be used for printing summaries of data, analysis, development of forecast procedures, and making forecasts.

The trend continued toward issuance of a simplified forecast report to serve the needs of cooperators within soil conservation districts. This type of report has been adopted in 4 States and in part of 4 other States. Specialized forecasts involving the hydrographs of streams were initiated to meet specific needs of some water users, depending on the type of water right.

Design and Construction—It became apparent during the past year that further study was needed on the design of sectional, reinforced concrete pipe drop-inlet barrels 28 inches or more in diameter. A survey of existing installations was initiated and it was found that ordinary tongue-and-groove-joint pipe with flat gaskets was not adequate in some installations.

The problem was presented to the American Concrete Pressure Pipe Association and the Association retained a consulting firm to make a study of the problem and prepare a report. This work is well underway.

Engineering services contracts were used to supplement Service design forces in handling the peak design load that usually develops in the spring of the year. Consultants were employed mainly on special or complex problems to provide guidance and advice and in some cases to prepare complete plans and specifications on complex or unusual problems. The Service improved the handling of such contracts in both the negotiation and operations stage; however, a Service engineer must still guide the work of the engineering firm and check their design computations and plans.

There was a significant shift of design work from regional units to the States. This trend will and should continue; it will be hampered, however, by a shortage of competent design engineers. This shortage can be expected to become more acute before it improves.

Geology—Notable progress was made toward improving the scope and quality of geologic data during the year. More States are acquiring better drilling equipment and sampling tools.

Close coordination was maintained with representatives of ARS on needs for research on specific problems related to geology. Arrangements were completed for an ARS staff member to inspect channels in the southeast and northwest areas to become better acquainted with channel stability problems encountered by SCS in the field.

Soil Conservation Districts

Since the primary job of the Soil Conservation Service is to provide technical help to farmers and ranchers cooperating with their local soil conservation districts, the Service continued to devote attention to working relations with districts. During the year a close review was made of operations in all districts with which the Service had memorandums of understanding. The General Accounting Office also made a review in several States of the manner in which soil conservation districts conduct their business affairs and Service relations with the districts.

During the year 30 new soil conservation districts were organized; but 24 districts were consolidated with other districts or dissolved, leaving a net increase of 6 districts. At the end of the year there were 2,861 soil conservation districts established and 6 other districts being assisted by the Service in the 50 States, Puerto Rico, and the Virgin Islands. These districts contain about 1,671,973,000 acres. About 95 percent of all farms and 91 percent of the land in farms of the continental United States are now included in soil conservation districts. Memorandums of understanding had been signed with 2,848 districts, which include about 1,668 million acres and 4,604,000 farms and ranches.

During the year 112,607 farmers and ranchers operating 38,479,023 acres became cooperators with their local districts. At the end of the year 1,849,525 farmers and ranchers operating about 571 million acres of land were listed as cooperators with districts.

Farm and Ranch Planning

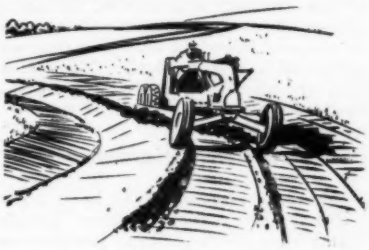
Soil conservation district cooperators developed 99,196 basic conservation plans, covering more than 32 million acres, during the year. This was an increase of about 7 percent over the previous year. In addition, 20,687 basic plans, covering nearly 12 million acres, were revised this year. At the end of the year, 1,301,450 farms and ranches, embracing more than 378 million acres, had basic conservation plans. Of this number, 209,838 basic plans had been fully applied at the end of the year.

Increased emphasis was given to basic planning this year. Also emphasized was the preparation of more adequate notes and records by technicians on the planning and application assistance given to SCD cooperators. Such records should be especially valuable in cases where the planning of a unit extends over a period of several months or more. The develop-

ment of more uniform technical guides at the work unit level also was stressed.

Pilot trials were started in 6 States to provide more accurate information on the costs and returns for alternative land uses and various combinations of conservation practices on different kinds of soil. This should result in giving SCS technicians better information to answer farmers' and ranchers' questions about costs and returns expected from various alternative uses and treatments of their land, and thus help them make sounder decisions about their conservation plans.

Rurban planning continued to receive more emphasis in districts near rapidly expanding population areas.



Land Treatment

Increased emphasis was placed on getting conservation practices applied to the land in accordance with a plan. Some time and effort were devoted to giving technical aid on individual conservation practices, especially where ACP cost-sharing was involved; but the main emphasis was on the application of practices that fitted into a coordinated land treatment program as specified in a basic conservation plan. The resulting progress for the year was gratifying. Special efforts were made to speed up the conservation treatment of land in all small watersheds approved for structural works of improvement.

Some of the more important conservation practices newly applied by SCD cooperators during the year include: 12 million acres of conservation cropping systems; 2.4 million acres of contour farming; 3.8 million acres of cover cropping; 10.7 million acres of crop residue use; 598,000 acres of stripcropping; 1.9 million acres of pasture improvement; 2.6 million acres of pasture planting; 2 million acres of rotation grazing; 38 million acres of proper range use; 15.8 million acres of deferred grazing; 1.1 million acres of range seeding; 910,000 acres of tree planting; 1.9 million acres of woodland improvement; 11 million acres of woodland protection; 436,000 acres of wildlife area treatment; 46,000 acres of grassed waterways; 34,000 miles of terracing; 266,000 acres of land grading and smoothing; 1.7 million acres of improved water application in irrigation; 1.2 million acres of drainage improvements; and 47,000 ponds constructed.

Watershed Protection and Flood Prevention

Watershed Protection (PL 566)—Applications for planning assistance, under Public Law 566, were received from 171 watersheds during the year. At the end of the year, 47 States and one Territory had submitted a total of 1,319 applications for Federal assistance in watershed planning.

During the year 120 applications were approved for work plan development. This brought the total watersheds approved for planning to 566. At the end of the year, planning had been suspended or terminated in a total of 95 watersheds. These suspensions or terminations were at the request of the local organizations or with their concurrence.

The work plan parties authorized for 42 States were supplemented by the assignment of planning personnel to other States according to the planning workload. The Forest Service, Bureau of Land Management, and Bureau of Indian Affairs assisted with watershed planning where watershed problems required such assistance.

In eight States, additional non-Federal planning assistance amounting to more than $1 million was provided through trust fund agreements, reimbursements, State-controlled planning parties, and personnel provided by States.

During the year, 84 projects were approved for "advanced engineering and other technical assistance" and 39 projects were approved for "construction of structural measures." This brought the total projects approved for Federal assistance in the installation of works of improvement to 264, covering about 15 million acres. Of those, 146 are approved for the "construction of structural measures."

Within the projects approved for works of improvement, about 54 percent of the total area is covered by SCD agreements and about 45 percent is covered by basic conservation plans. Soil surveys have been completed on about 66 percent of the total area of these projects.

The principal structural measures installed as of June 30, 1960, included 239 floodwater retarding structures and 178 miles of stream channel improvement.

Watershed Protection (Pilot)—There were 32 active pilot watershed protection projects during the year. Federal assistance in 23 projects was completed prior to this year except for project evaluation and completion reports in some projects. Seven projects have been discontinued at the request of the local sponsors before completion of the planned measures. Ten additional projects were completed except for project evaluations and completion reports during the year. Fifteen projects are scheduled for completion in fiscal year 1961. Seven projects will be continued after 1961.

The principal structural measures installed as of June 30, 1960, in 58 pilot projects included: 299 floodwater retarding structures; 1,696 stabilizing and sediment control structures; 232 silt and debris basins; 269 miles of stream channel improvement; and 415 miles of roadside erosion control.

In addition, 15,864 acres of critical sediment-producing areas have been planted to grasses and legumes, and 10,972 acres have been planted to trees.

At the end of the year, 64 percent of the total land area in these watersheds was covered by SCD agreements; basic conservation plans were developed on 47 percent of the area, covering 54 percent of the farms; and soil surveys had been completed on 74 percent of the total area.

Flood Prevention—Work plans were prepared for 12 subwatershed areas during the year in the 11 authorized flood prevention watersheds. This makes a total of 182 subwatersheds and 16 subwatershed area work plans completed to date.

The principal structural measures installed as of June 30, 1960, in the 11 authorized watersheds included 956 floodwater retarding structures; 850 stabilizing and sediment control structures; 246 silt and debris basins; 1,355 miles of stream channel improvement; and 2,945 miles of roadside erosion control.

In addition, 142,218 acres of critical sediment-producing areas had been planted to grasses and legumes and 188,235 acres had been planted to trees.

In the subwatersheds where work plans have been completed, about 55.6 percent of the total land area was covered by SCD agreements and basic conservation plans had been completed

on 47 percent of the operating units covering about 43 percent of the area. Soil surveys had been completed on about 65 percent of the total area of the 11 authorized watersheds.

Emergency Measures—Six watersheds were given emergency treatment to prevent serious sediment and flood damage from forest fires during the year. A total of $229,298 of Flood Prevention Emergency Measure funds were allocated for treatment of these areas.

River Basin Activities

Service personnel represented the Department on five Inter-Agency River Basin Committees, as follows: Arkansas-White-Red Basins Inter-Agency Committee; Missouri Basin Inter-Agency Committee; Columbia Basin Inter-Agency Committee; Pacific Southwest Inter-Agency Committee; Northeastern Resources Committee.

The Department is participating in several river basin surveys and investigations with other Federal or State agencies. The Soil Conservation Service, Agricultural Research Service, and Forest Service are the principal Department agencies concerned with these surveys and investigations, with the SCS member acting as chairman of the various advisory committees.

The principal basins involved in these surveys and investigations are: Delaware River, Potomac River, Lower Mississippi and tributaries, Yazoo-Mississippi flood plain in Mississippi, Kansas River in Kansas, Upper Colorado River, Cape Fear River, Upper Mississippi River and Great Lakes, Huron River, Upper Willamette and Deschutes Rivers, Bayou Bartholemew in Arkansas and Louisiana, Humboldt River, and Sevier River.

SCS representatives served as Department advisors to Federal members of 6 interstate compact commissions. These commissions are in the process of negotiating interstate compacts on the Arkansas River by Kansas and Oklahoma; on the Arkansas River by Oklahoma and Arkansas; on the Red River by Oklahoma, Texas, Arkansas, and Louisiana; on the Niobrara River by Wyoming, South Dakota, and Nebraska; on the Carson, Truckee, and Walker Rivers and Lake Tahoe and tributaries by Nevada and California; and on the Wabash Valley Interstate Commission established by Public Law 86-375.

The Department provided data and other assistance to the U.S. Study Commissions for eight river basins in Texas and a group of Southeast river basins.

Great Plains Conservation Program

Farmers and ranchers entered into 2,048 contracts covering about 5,571,000 acres under the Great Plains Conservation Program during the year. Included in these contracts were more than 180,000 acres of planned cropland conversions and about 114,000 acres of planned range reseeding. Work was performed on all 24 conservation practices listed for cost sharing under the GPCP.

As of June 30, 1960, 352 counties in 10 States were authorized to participate in the program. In these counties, 4,935 contracts covering about 13,231,000 acres had been signed. Altogether, about 449,000 acres of former cropland are to be converted to range or other types of permanent vegetation under these contracts, and about 482,000 acres of rangeland are to be reseeded. An additional 3,084 applications, covering about 9,946,000 acres, had been filed at the end of the year.

Conservation Needs

The National Inventory of Soil and Water Conservation Needs was nearing completion at the end of the fiscal year. Most of the county and State committee reports were completed and summaries received by the Departmental committee in Washington.

The Department Committee developed procedures for the review of State Inventories and some progress had been made in this respect. National results should be published in 1961.

The data for all counties in the United States by land capability subclasses for both present and expected land use is being put on punch cards for machine processing. Thus, summaries in a form suitable for offset printing will be provided the States for their publications and also for the National publication.

The Inventory will provide, for counties and States as well as for USDA, one of the most important sources of resource information ever available. Many uses and byproducts will result from the Inventory data.

Other Programs

The Service continued to assist Agricultural Conservation Program participants with permanent-type practices on which cost sharing was requested. Such service was provided in about 434,000 instances, affecting 332,000 farms. Of the farms on which assistance was given in this program, about 224,000 were SCD cooperators.

The Service provided technical assistance to about 4,000 participants in the Conservation Reserve Program of the Soil Bank during the year.

The Service continued to give direct assistance to Rural Development activities in designated areas where special funds were allotted. This assistance was mainly in soil survey work and farm planning and was in addition to regular technical help given to soil conservation district cooperators.

Assistance to the Farmers Home Administration in its conservation and watershed loan programs was continued.

From Cash Crops To Livestock

By Robert A. Hardin

THE proper use of the land on our ranch is due mainly to cost accounting," says Roy Kayler, who in eight years changed the irrigated, 900-acre Short Ranch from sagebrush to a highly productive cattle ranch.

It is well worth while to drive past the Short Ranch, northeast of Moses Lake, Wash. One can see at a glance the tremendous productive capability of the ranch.

Last year the alfalfa crop, piled in 12 large stacks next to the corrals, totaled more than 1,700 tons. In 1959, 1,500 head of 400-pound calves were fed to become 1,000- to 1,100-pound choice beeves. In addition, around 1,650 tons of sugar beets were raised on the farm. Presently, there are more than 1,000 head of cattle in the corrals and on the fields. Kayler feels the ranch has the capacity for an additional 1,000 head of cattle per year.

Many conservation practices can be observed in driving through the Short Ranch. Proper land use and rotation are evidenced by the rolling pastures and hay fields. More than 7,000 feet of the head ditches are concrete lined. The rest of the head ditches and all of the waste ditches are seeded to redtop. There are two irrigation reservoirs, and seven weed screens.

The conservation practices on the Short Ranch were arrived at mainly by a keen mind and a sharp pencil. Kayler, once a business student at the University of Idaho, has figures to prove the value of each of his conservation practices. They all have paid very well.

Kayler feels the most significant of all the conservation measures he has employed is proper land use. How he arrived at the decision to

Note:—The author is soil scientist, Soil Conservation Service, Moses Lake, Wash.

Roy Kayler (left) with his father-in-law, Howard Short, stand in front of a part of the 1,700 tons of hay produced on the ranch in 1959.

Part of the feeding pens and hay stacks on the Short Ranch.

so manage the farm is an interesting story.

In 1954, a cost accounting system was developed for the entire ranch, which was then a cash crop operation with potatoes, sugar beets, beans, wheat, and oats as the principal crops. Time cards for labor and other expenses were carefully recorded for each field. At the end of the season, when the books were balanced, Kayler and the other owners of the ranch decided the operation was not paying as it should. To quote Kayler, "It appeared the equipment investment and maintenance per acre was greater than could be justified by the return."

That winter, Kayler visited the Moses Lake Soil Conservation District office. There he and Pershing Vance, SCS technician, studied the soil maps, and noted that much of the land on the farm was in capability classes II, III, and IV. The decision was made to swing the farm from a cash crop operation toward a livestock program. By 1959, the operation included 200 acres of irrigated pasture, 400 acres of hayland, 75 acres of sugar beets, and 150 acres of range. Cattle were chosen because of their ability to consume roughage, which the farm could produce plentifully. Kayler feels his present operation is far superior to the previous one. It is more lucrative and he is properly maintaining his land.

The present program allows Kayler to make efficient use of his labor and equipment. Two permanent hands plus seasonal labor are employed on the ranch. All of the farm work is accomplished with four tractors.

Kayler was chosen Grant County Cattleman and Washington State Cattle Feeder for 1959. In 1957 and 1959 he was nominee for the Conservation Farmer of the Year of the Moses Lake Soil Conservation District.

During daylight hours Kayler usually is found on the ranch. He is equally at home on a horse, a tractor, or behind a desk. In addition to meeting the demands of the ranch, he has found time to serve as treasurer of the Columbia Basin Feeders Association, as director of the Moses Lake Mosquito Control District, and as a member of the Moses Lake Chamber of Commerce Agricultural Committee.

Associated with Kayler in the ranch are his father-in-law, Howard Short, who lives on the ranch; and Robert Peterson, Clyde Marsh, and Mrs. C. O. Armstrong, all of Moscow.

Kayler feels the Columbia Basin is a nearly ideal feeding area. It has a low rainfall (8-inch average precipitation); is close to calf-producing areas; is close to fat cattle markets; and there is an ample supply of good feed.

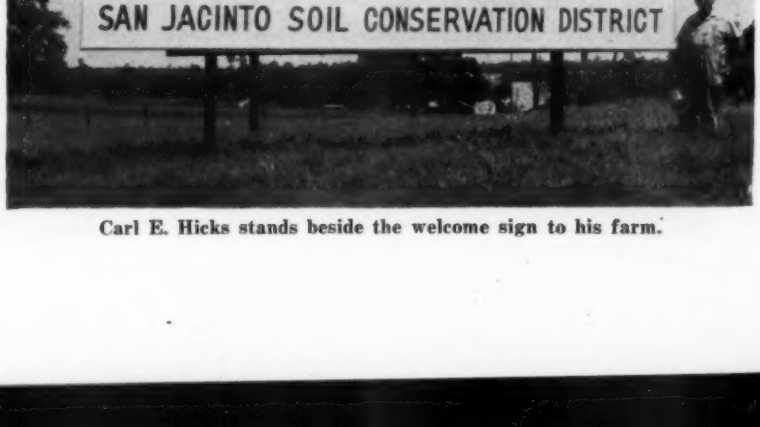
The development of the Short Ranch, which originally was sagebrush and cheatgrass, started in 1952. Kayler and his helpers had to ford Crab Creek and travel a rough trail to reach the ranch at that time. They arrived ahead of the irrigation water, electricity, and telephones. The original party lived in tents and hauled water until a bunkhouse was built and a well drilled.

Kayler recalls that a sign was found on a nearby abandoned homestead that read: "One mile to water, 7 miles to town, 6 inches to Hell. You can have it." One wonders what the homesteader would say if he saw the Short Ranch today.

Carl E. Hicks of Texas

ON May 7, 1960, Carl E. Hicks received the *Fort Worth Press* Award for being the Outstanding Conservation Farmer in Texas in 1959. He is proud of that honor.

His 249-acre farm is 40 miles north of Houston on the Houston-Dallas Highway. On July 14 he erected a sign to announce to a motoring America that he was the State's Conservation Winner. He wanted to say "thanks" to the



Carl E. Hicks stands beside the welcome sign to his farm.

Fort Worth Press, but most of all he wanted to invite farmers and ranchers or anyone interested in conservation to come in and share the benefits of his achievement.

During the last 5 years Hicks has shared with hundreds of people the conservation knowledge and ideas that he has acquired over a period of years.

He has not always been a conservation farmer. Before he became a cooperator of the San Jacinto Soil Conservation District in 1945 much of his land was in clean-tilled, soil-depleting row crops. It took 15 years of conservation farming to get his place looking as it does today—15 years of hard work and planned attack against soil erosion, low fertility, and a well entrenched system of soil exploitation that had been followed for half a century.

When Hicks became a conservation farmer, he went into the cattle business. He now has some of the best Angus cattle in the Gulf Coast area. He constantly strives to improve them through selective breeding.

Hicks not only has changed from a system of exploitation to one of conservation, but he also has influenced other cooperators to make that change. He discovered for himself that sound land management and conservation of his soil, plant, and water resources are a very necessary part of the continuous, economical production of high-quality forage.

But conservation is more than that to Hicks. It is a conviction—a conviction that if this Nation's farmers are to stay in business, then the "conservation way" is the only way.

—Cleo Dark

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No matter how you look at it, stubble burning costs you money. The organic matter not only helps maintain soil fertility but also helps the soil absorb more moisture.

Farm Donated to SCD

By Mitchell G. Hassler

HARLEY L. Hancock, 76-year-old retired Indiana farmer, wanted his farm properly cared for after he was gone—so he gave it to the Owen County Soil Conservation District.

Mr. Hancock now lives quietly in the State Soldiers' Home at Lafayette, satisfied that his beloved land is not only getting the care it deserves but that it is also serving many useful purposes for the district.

Hancock bought the 45-acre farm in 1919 with his soldier's bonus from World War I. Twenty-five acres was in woods. For 40 years he managed these woods according to the best forestry methods he could find—by reading books on woodland management by the late Gifford Pinchot, from knowledge gained through experience, and from what he saw of forestry work overseas while in the armed forces.

The district board already has plans for making the farm a community asset. Demonstrations and tours in woodland management, improvement cutting, pine tree plantings, and tree identification will be held for 4-H members, Boy Scouts, and other groups. Wildlife area improvement and logging demonstrations are foreseen for the future on this farm.

The district supervisors see many recreational and aesthetic values on this land, considering the huge flowing spring, potential camping sites, and wide variety of trees.

A minimum tillage (plow-plant)

Note:—The author is work unit conservationist, Soil Conservation Service, Paoli, Ind.

Harley L. Hancock presenting the deed to his farm to Thomas Macy (left) chairman of the SCD board of supervisors, while other supervisors look on.

demonstration is planned for the 20 acres of cropland next year. It is now seeded to clover for a deserved rest.

All profits from both woodland and cropland will be used to further the district program and to encourage more and better participation in 4-H forestry, soil conservation, and wildlife projects.

In 1936 Mr. Hancock completed and recorded an inventory of his woodland (by species, total number of stems, largest tree of each kind, and total board-foot content). He did this in each of four tracts of timber. Again in 1950 he tallied the timber in the same manner and recorded the date. Records for both inventories plus the harvested total for the 40-year period were given with the farm to the soil conservation district.

Another inventory is now being made. Forty years of good woodland management data from these three complete inventories with records of all harvested material should yield sound timber growth data of great value to the district and its cooperators.

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Productivity of the U.S. farm worker is growing more than twice as fast as that of industry. Since 1950, output per man-hour in nonagricultural industry has risen 2 percent a year, compared to 5 percent in agriculture.

Soil Temperature Tests On Cotton Planting Time

West Texas cotton farmers have their first reliable planting guide as a result of recent soil temperature studies at Lubbock, Tex. Cotton seedlings emerge earlier and grow faster and more vigorously if planting is delayed until minimum temperatures 8 inches below the soil surface average between 60° and 70°F. for 10 days.

Plants appeared in 5 to 9 days instead of the 2 weeks required when temperatures were below 60°. In addition, the chances of obtaining a good stand doubled. No decline in fiber quality accompanied the accelerated growth if seeds were in the ground before May 30.

Cottonseed is planted only 1 to 2 inches below the soil surface, but the workers found the 8-inch-depth temperature more accurate in figuring the average. At a depth of 8 inches, temperatures are less erratic than they are nearer the surface, yet fluctuate enough to indicate conditions at planting level.

Cotton must be planted on the Texas High Plains as soon as the danger of frost is past because of the short growing season—the mean frost-free period at Lubbock is 205 days and cotton needs warm days in which to grow. But if seeds are in the ground too early, a poor stand will result. The ideal date for planting varies from year to year.

First World Farm Machinery Congress

The first International Congress of Agricultural Machinery will be held in Paris March 2-7, 1961. During the five half-day sessions, agricultural engineering personnel from many countries will discuss papers written on the following subjects:

1. General human and social problems, especially those concerning training, arising from the mechanization of agriculture in insufficiently equipped countries which are undergoing development.
2. Economic and financial problems arising from mechanization in these countries.
3. Technical means of reclaiming land in these countries—land clearing, irrigation, and soil preparation and conservation.
4. Methods used in these countries for cultivating special crops (cereals, rice, cotton, peanuts).

The Congress will be followed on March 8 and 9 by a visit to the French Farm Machinery Show and to factories.

Further information may be obtained from the Secretariat General du Congres International Agricole, Paris, France.

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A farm conservation plan is the only safe shortcut to a permanent agriculture.